MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole Log Data Report

Log Event A

Borehole 50-09-10

Borehole Information

Farm : T	**Tank :** T-109	**Site Number :** 299-W10-114
N-Coord : 43,480	**W-Coord :** 75,870	**TOC Elevation :** 671.26
Water Level, ft :	**Date Drilled :** 7/31/1973	

Casing Record

Type :	Steel-welded	Thickness, in. :	0.280	ID, in. :	6
Top Depth, ft. :	0	Bottom Depth, ft. :	121		
Type :	Steel-welded	Thickness, in. :	0.250	ID, in. :	4
Top Depth, ft. :	0	Bottom Depth, ft. :	121		

Cement Top, ft. : 0

Borehole Notes:

Borehole 50-09-10 was originally drilled in July 1973 to a depth of 93 ft with 6-in. casing. The borehole was deepened to 121 ft in April 1977. The method used to deepen the borehole is not identified in information presented in the driller's log or Chamness and Merz (1993).

Observations made in the field suggest that 6-in. and 4-in. casings are present in the borehole and that the space between the two casings has been grouted, but there are no data to indicate to what depths the two casings extend. In addition, the driller's log recorded during deepening operations in 1977 indicates that the 6-in. casing was perforated. A possible explanation is that these perforations were cut as part of a borehole deepening process and a 4-in.-diameter casing was installed inside the 6-in. casing and grouted in place. This apparently was a standard practice in this portion of the tank farms in 1977. The driller's log, however, does not mention the installation of a 4-in.-diameter casing or any grout.

The top of the casing, which is the zero reference for the SGLS, is approximately even with the ground surface.

Equipment Information

Logging System : 2B	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 10/1997	**Calibration Reference :** GJO-HAN-14	**Logging Procedure :** MAC-VZCP 1.7.10-1

Logging Information

Log Run Number :	1	**Log Run Date :**	12/30/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	0.0	**Counting Time, sec.:**	200	**L/R :** L	**Shield :** N
Finish Depth, ft. :	2.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	2	**Log Run Date :**	12/31/1997	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	1.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :** N	
Finish Depth, ft. :	43.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	3	**Log Run Date :**	01/05/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	42.0	**Counting Time, sec.:**	200	**L/R :** L **Shield :** N	
Finish Depth, ft. :	72.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a
Log Run Number :	4	**Log Run Date :**	01/06/1998	**Logging Engineer:**	Alan Pearson
Start Depth, ft.:	119.5	**Counting Time, sec.:**	200	**L/R :** L **Shield :** N	
Finish Depth, ft. :	71.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Logging Operation Notes:

Borehole 50-09-10 was logged in four runs. The total logging depth achieved by the SGLS was 119.5 ft. Spectra were collected at intervals of 0.5 ft using a 200-s counting time.

Analysis Information

Analyst : D.L. Parker

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 05/11/1998

Analysis Notes :

The pre-survey and post-survey field verification for each logging run met the acceptance criteria established for peak shape and system efficiency. The energy calibration and peak-shape calibration from the field verification spectrum that most closely matched the field data were used to establish the peak resolution and channel-to-energy parameters used in processing the spectra.

A casing correction factor for a 0.50-in.-thick steel casing was applied to the concentration data during the analysis process. This casing correction factor was chosen because it most closely matches the combined thickness of 6-in. and 4-in.-casings. Although this correction factor does not match actual field conditions, it is probably the closest to the field conditions. Use of this casing correction factor will cause radionuclide concentrations to be undercalculated.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations. Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

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A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of selected historical gross gamma log data collected from 1980 to 1994 is included with the SGLS data.

Results/Interpretations:

The man-made radionuclides detected by the SGLS in this borehole were Cs-137, Co-60, Eu-154, and Eu-152. The Cs-137 contamination was detected continuously from the ground surface to 14.5 ft, almost continuously from 82 to 92 ft, almost continuously from 104.5 to 111.2 ft, and continuously from 116.5 to the bottom of the logged interval (119.5 ft). Cs-137 contamination was also detected at depths of 17.5 and 23 ft. The maximum apparent Cs-137 concentration of 4.6 pCi/g occurs at 91.5 ft.

Co-60 contamination was detected continuously from 38.5 to 42.5 ft and almost continuously from 48.5 ft to the bottom of the logged interval (119.5 ft). The maximum apparent Co-60 concentration was recorded as 70.2 pCi/g at 101.5 ft.

Eu-154 contamination was detected continuously from 38 to 42.5 ft, 48 to 92 ft, 103 to 110 ft, and 117 ft to the bottom of the logged interval (119.5 ft). Eu-154 concentrations reached a maximum apparent concentration of 129.8 pCi/g at 51.5 ft.

Eu-152 contamination was detected intermittently from 50 to 57 ft and at a depth of 39.5 ft. The maximum apparent Eu-152 concentration of 2.78 pCi/g occurs at a depth of 52 ft.